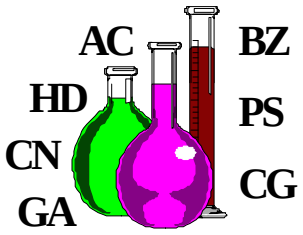
U.S. Army Center for Health Promotion and Preventive Medicine



Detailed Facts About Sulfur Mustard Agent HT

218-09-1096

Physical Properties of Sulfur Mustard Agent HT

Chemical Structure	Plant mixture of 60% Sulfur Mustard (HD) and 40% Sulfur Mustard (T) by weight; (The CDC has pointed out that with time, these proportions change. Also, presence of impurities has resulted in reaction products.)
Chemical Formula	HD: $C_4 H_8 C_{12} S$ T: $C_8 H_{16} C_{12} 0 S_2$
Description	T is a sulfur and chlorine compound similar in structure to HD and is a clear yellowish liquid with a slight garlic- or mustard-like odor.
Molecular Weight	159.08
Boiling Point	Above 228°C
Freezing Point	0.0 to 1.3°C
Density	Liquid = 1.27 Vapor = 6.92 (air = 1)
Solubility	Practically insoluble in water.
Flash Point	100°C (approximately)
Volatility	831 mg/m^3 @ 25°C
Toxicity Values	Not established in humans.

Agent HT - A mixture of 60% HD and 40% T; T is bis 2 (chloroethylthioethyl) ether, Chemical Abstract Service Registry No. 6392-89-8.

Exposure Limits

Workplace Time-Weighted Average - 0.003 mg/m^3
General Population Limits - 0.0001 mg/m^3

Toxic Properties of Sulfur Mustard Agent HT

HT is a lethal vesicant composed of approximately 60-percent HD and 40-percent agent T. The effects of HT would encompass those of both HD and T.

Overexposure Effects

HD is a vesicant (blister agent) and alkylating agent producing cytotoxic action on the hematopoietic (blood forming) tissues which are especially sensitive. The rate of detoxification of HD in the body is very slow, and repeated exposures produce a cumulative effect. It causes blisters, irritates the eyes, and it is toxic when inhaled. HD has been determined to be a human carcinogen by the International Agency for Research on Cancer.

Emergency and First Aid Procedures

Inhalation: remove victim from the source immediately; administer artificial respiration if breathing has stopped; administer oxygen if breathing is difficult; seek medical attention immediately.

Eye Contact: speed in decontaminating the eyes is absolutely essential; remove victim from the liquid source, flush the eyes immediately with water by tilting the head to the side, pulling the eyelids apart with the fingers, and pouring water slowly into the eyes; do not cover eyes with bandages; but if necessary, protect eyes by means of dark or opaque goggles; seek medical attention immediately.

Skin Contact: don respiratory protective masks and gloves; remove victim from agent source immediately; flush skin and clothes with 5 percent solution of sodium hypochlorite or liquid household bleach within 1 minute; cut and remove contaminated clothing; flush contaminated skin area again with 5 percent sodium hypochlorite solution; then wash contaminated skin area with soap and water; seek medical attention immediately.

Ingestion: do not induce vomiting; give victim milk to drink; seek medical attention immediately.

Protective Equipment

Protective Gloves:	MANDATORY - Wear Butyl toxicological agent protective gloves (M3, M4, gloveset).
Eye Protection:	Wear chemical goggles as a minimum; use goggles and face shield for splash hazard.

Other:	Wear gloves and lab coat with M9 or M17 mask readily available for general lab work. In addition, wear daily clean smock, foot covers, and head cover when handling contaminated lab animals.

Reactivity Data

Stability:	Stable at ambient temperatures; decomposition temperature is 165°C to 185°C.
Incompatibility:	Rapidly corrosive to brass @ 65°C; will corrode steel at .001 in. of steel per month @ 65°C.
Hazardous Decomposition:	HT will hydrolyze to form HCl and thiodiglycol, and bis-(2-(2-hydroxyethylthio) ethyl ether.
Hazardous Polymerization:	Will not occur.
Persistency	Depends on munition used and the weather; heavily splashed liquid persists 1 to 2 days in concentration to provide casualties of military significance under average weather conditions, and a week to months under very cold conditions.

References

1. Department of the Army Pamphlet (DA PAM) 40-173, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents, H, HD, and HT*, 30 August 1991.

2. Department of the Army Field Manual (DA FM) 3-9, *Potential Military Chemical/Biological Agents and Compounds*, 1990.

3. U.S. Army Chemical Command Materiel Destruction Agency, *Site Monitoring Concept Study*, 15 September 1993.

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